UNITED STATES UTILITY PATENT APPLICATION

ELECTRONIC DOORBELL SYSTEM

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ELECTRONIC DOORBELL SYSTEM

FIELD OF THE INVENTION

This invention relates generally to a doorbell system and more particularly to an electronic doorbell programmed to automatically identify and respond to visitors or guests.

BACKGROUND OF THE INVENTION

Doorbells are well known for announcing or signaling the arrival of a visitor at a building, usually a home. However, in general, a doorbell does not recognize the specific identity of a visitor. As a result, a home dweller that may not wish to be disturbed is forced to make her presence known to the visitor. Alternatively, the home dweller may ignore someone that she would not have ignored, had the visitor been identified to her.

Another disadvantage of doorbells occurs if the home dweller is not at home, and she misses visitors and does not know it. This is detrimental if the visitor is someone of importance. There are generally no existing doorbells with means to alert a home dweller in a remote location when there is a visitor.

U.S. 5,365,214 teaches a doorbell system that includes a plurality of stored tones or songs in the doorbell memory. The different songs or tunes are triggered by different events. The opening of a front door, the opening of a back door, or the depression of a particular doorbell button may trigger different songs or tunes. As a result, it is possible to identify the location from which the song or tune is triggered. However it is not possible to recognize the identity of the visitor.

Many present day doorbells are stand-alone devices with a button and an enunciator. Options for the sound that the annunciator makes have been limited, and generally are not customized to a specific guest. U.S. 6,175,298 B1 teaches a doorbell system having a sound

1   memory for storing and playing a CD quality sound. A plurality of musical sounds are stored

2   in the doorbell memory. The storage of the sounds may involve the use of a personal

3   computer. This patent does not disclose how any of the plurality of stored sounds is selected

4   nor does it disclose a stored sound identifying a particular visitor.

5

6   Cameras have been used in conjunction with doorbells in order to recognize visitors.

7   U.S. 5,995,139 teaches an interactive system for identifying visitors using a camera and a

8   home computer in conjunction with a doorbell. Image data is captured by the camera, and

9   displayed on a monitor. Although the visitor may be identified this way, the identification is

10   not automatically done by the system. The home dweller recognizes the guest herself from

11   the image displayed. Generally, existing doorbells do not automatically identify visitors.

12

13   SUMMARY OF THE INVENTION

14

15   In one respect, the invention is a doorbell arrangement. The doorbell arrangement

16   includes a user interface for entering a user code. The user code is indicative of a specific

17   visitor. The doorbell arrangement also includes a logic circuit for identifying the specific

18   visitor. The identification of the specific visitor is based on the entered user code. The

19   arrangement further includes a signal transmitter for transmitting a particular response

20   signal. The particular response signal is based on the identification of the user by the

21   logic circuit.

22

23   In another respect, the invention is a method of identifying a visitor by using a

24   doorbell arrangement. In this respect, the doorbell arrangement has a user interface for

25   entering a user code. The method of identifying a visitor includes the step of receiving the

26   user code. The user code is indicative of the visitor. The method also includes the step of

27   identifying the visitor from the user code. The method of identifying a visitor also

28   includes the step of transmitting a signal in response to the identification of the visitor.

29   The response signal is indicative of the visitor.

30

1 In comparison to known prior art, certain embodiments of the invention are capable of

2 achieving certain aspects, including some or all of the following: identifying visitors without

3 the visitor knowing if the home dweller is home or not; automatically responding to visitors;

4 and, notifying a home dweller at a remote location that she has visitors. Furthermore, the

5 system also provides increased home security. Those skilled in the art will appreciate these

6 and other aspects of various embodiments of the invention upon reading the following

7 detailed description of a preferred embodiment with reference to the below-listed drawings.

8

9 BRIEF DESCRIPTION OF THE DRAWINGS

10

11 Figure 1A is a block diagram illustrating an electronic doorbell according to a first

12 exemplary embodiment of the invention;

13 Figure 1B is a diagram illustrating an example of a keypad to be used in the invention;

14 Figure 2 is a block diagram illustrating an electronic doorbell connected to a

15 computer, according to a second exemplary embodiment of the invention;

16 Figure 3 is a flow chart illustrating an exemplary method that may be performed by

17 the doorbell 100 or the doorbell system 222;

18 Figure 4A is a chart illustrating examples of keystroke sequences used by different

19 guests; and

20 Figure 4B is a chart illustrating examples of audio responses.

21

22

23 DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

24

25 Figure 1A illustrates an electronic doorbell 100 according to a first exemplary

26 embodiment of the invention. The electronic doorbell 100 may be positioned inside or

27 outside a house, a dorm, or other residence or the like, in conventional manner. Various

28 interface devices may be used in conjunction with the doorbell 100. These devices are used

29 by visitors to enter user codes, and may include a keypad 101, a camera 102, or a microphone

1 103. The interface devices 101, 102, and 103 may be positioned in the proximity of a

2 doorway, gateway, entryway or the like.

3

4 Figure 1B illustrates an example of a keypad 101 to be used in conjunction with the

5 doorbell 100. The keypad 101 includes alphanumeric keys or buttons 105. In addition, the

6 keys may have distinguishing symbols. The keypad 101 may also contain any reasonable

7 number of keys 105 for purposes of the invention. The keys or buttons may be depressed to

8 enter user codes.

9

10 The camera 102 of Figure 1A may include a CCD (Charge Coupled Device) for

11 capturing a visitor's image and for outputting data according to the brightness of light

12 detected from these images. The camera 102 may also include a scanner for scanning a

13 fingerprint or fingerprint impression. With the camera 102, the user codes are entered as

14 image data.

15

16 The microphone 103 includes conventional audio components for capturing sound

17 waves. With the microphone 103, the user codes are entered in the form of audio data. All or

18 one of the interface elements may be included at any particular time.

19

20 Figure 1A also illustrates a doorbell logic circuit 110. The logic circuit 110 is

21 connected to the interface devices for receiving and processing the user codes. The logic

22 circuit 110 processes the user codes in order to identify different visitors. The doorbell 100

23 also includes a memory module 120. The memory module 120 provides storage area for

24 codes used by the logic circuit 110 in processing user information. The logic circuit 110

25 compares the stored codes with the user-entered codes. The memory module 120 also stores

26 audio responses that are used in response to the identification of a particular visitor, as will be

27 explained in a subsequent section of the disclosure.

28

29 The doorbell 100 also includes an A/D (Analog to Digital) converter 130 and a D/A

30 (Digital to Analog) converter 140. These components are used to convert analog signals into

1   digital information and digital information into analog signals respectively. For instance, the

2   A/D converter may be used to convert from analog to digital format, audio data entered

3   through the microphone 103. The doorbell 100 also includes an audio amplifier 150 for

4   amplifying audio signals. A power supply 160 may be used for providing power to the

5   doorbell 100. The power supply 120 may be a 120VAC. The power supply may also be a

6   battery or any other conventional means of supplying power.

7

8   The doorbell 100 also includes a speaker 170, for transmitting audio feedback to a

9   visitor using the doorbell 100. The speaker 170 may be located in the proximity of a

10 doorway, gateway, entryway or the like where a visitor can hear the audio feedback. In

11 addition to the speaker 170, there may also be a plurality of other speakers (not shown)

12 throughout the residence or home, associated with the doorbell 100. These additional

13 speakers allow the home dweller to hear the audio responses.

14

15 Figure 3 is a flow chart illustrating an exemplary method of identifying a visitor using

16 the apparatus of Figure 1A. As illustrated at step 310, a user code from a visitor is received

17 by the doorbell system. A user code may be representative of one visitor or a plurality of

18 visitors. For example, a single user code may represent a home dweller's co-workers.

19 Another code may represent the home dweller's best friend. In step 310, the user code may be

20 entered in a variety of ways, depending on the type of interface device used with the

21 apparatus.

22

23 When the keyboard 101 is the interface device, depressing the keys or buttons on the

24 keyboard in a particular keystroke sequence enters the user code. A keystroke sequence may

25 be the depression of a key or a plurality of keys in a predetermined order. For example, a

26 particular visitor may be instructed beforehand by a home dweller to depress specific keys.

27 Another visitor may be instructed by the home dweller to use a different keystroke sequence.

28 The particular sequence is chosen so that the guests can be identified and distinguished, as

29 will be explained in more detail in a subsequent section of this disclosure.

30

1   When a camera 102 is used as the interface device, the user code is image data

2   captured by the camera. The image data may include image data (digital or analog) of a

3   user's face, an insignia, a badge, a fingerprint pattern, a barcode, or any other unique

4   recognizable feature that can be captured as an image. The image data may be captured by

5   using conventional means that triggers the camera to capture an image. When a microphone

6   103 is used as the interface device, the user code is the audio data entered by the user. The

7   audio data may be a user's voice or sequenced clapping pattern or the like.

8

9   Returning to Figure 3, as illustrated, after the user code is received at step 310, the

10   user code is identified at step 320. The logic circuit 110 of Figure 1A is used to identify the

11   user code that is entered. In identifying a visitor from the user code, the logic circuit 110

12   relies on stored codes in the memory 120. The logic circuit 110 compares and matches

13   entered user codes with stored codes. When a user code matches a stored code, a visitor is

14   identified. It should be noted that because one user code may be representative of a group of

15   visitors, the circuit 110 may identity a group of possible visitors as opposed to a specific

16   individual.

17

18   The identifying step 320 may vary depending on the type of user code. User codes

19   entered using the keypad 101 may be recognized from the keystroke sequence. As described

20   previously, a keystroke sequence may be the depression of a key or a plurality of keys in a

21   predetermined order. Each keystroke sequence is representative of a particular user or a

22   particular group of possible users. The logic circuit 110 compares the user entered keystroke

23   sequence with stored keystroke sequences. When there is a match between the stored

24   keystroke sequence and the user entered keystroke sequence, a visitor is identified. If there is

25   no match, the visitor is not identified.

26

27   Figure 4A is a table showing examples of keystroke sequences used by different

28   visitors or guests. As illustrated, the keystroke sequence "1" "2" "A" may be a delivery

29   person's user code, "B" "B" "5" may be a neighbor's user code and keystroke sequence

30   "Generic Guest" may be a user code for generic guests.

1

2   Returning to the identifying step 320, when the camera 102 is used as the interface

3   device, the image data captured is the user code. As stated before, the image data may

4   comprise a barcode, a fingerprint, a scanned badge, an insignia, or an image of the visitor's

5   face, etc. The image data is identified using the logic circuit 110. The logic circuit 110

6   compares the user entered image data sequence with stored image data. When there is a

7   match between the stored image data and the user entered image data, the visitor is identified.

8   If there is no match, the visitor is not identified.

9

10   When the microphone 153 is the interface device, the user code is the audio data

11   captured. As stated, the audio data may comprise a voice recording or a sequenced sound

12   such as a clapping sequence. The audio data is identified using the logic circuit 110. The

13   logic circuit 110 compares the user entered audio data with stored audio data. When there is a

14   match between the stored audio data and the user entered audio data, the visitor is identified.

15   If there is no match, the visitor is not identified.

16

17   As illustrated in Figure 3, upon the identification of a user code at step 320, the

18   generation of a response signal takes place at step 330. The response signal may be an audio

19   response signal. The audio response signal enables a home dweller to identify the visitor at

20   the door. The audio responses are made audible to the home dweller through speakers (not

21   shown) placed in any preferred location at the house. The audio response may be made

22   audible to the visitor via transmission through speaker 170.

23

24   Figure 4B is a table showing examples of audio responses based upon the

25   identification of particular visitors or guests. Each audio response is geared towards

26   particular identified visitors. The audio responses may be musical tunes, voice recorded

27   phrases or sentences of any desired language, bell chimes, or the like. As illustrated in the

28   Figure 4B, the audio response for a generic guest may be a bell chime "Ding Dong." The

29   response for the next-door neighbor may be the voice recording; "We're not at home at the

30   moment." The response for a best friend may be the phrase "Come to the back door." The

1   doorbell memory 120 provides the audio response. There may also be a default audio signal

2   for unrecognized or unidentified guests.

3

4   Figure 2 is a block diagram illustrating an electronic doorbell system 222 with the

5   doorbell 100 interfaced with a computer 200, according to a second exemplary embodiment

6   of the invention. Typically the computer 200 may be a personal computer such as a laptop or

7   a desktop computer. The computer 200 may include a database or memory 205 with stored

8   audio files for providing responses to visitors. The computer 200 may be connected to the

9   doorbell 100 by means of a hardwire connection or the like. The connection may also be

10   wireless such as a Blue Tooth, infrared or radio frequency connection.

11

12   Figure 2 also shows a communication device 250 connected to the computer. The

13   communication device 250 may be a modem, transceiver or the like, and may be used to

14   transmit and receive radio frequency signals. Typically, the computer 200 controls the

15   functions of the communication device 250. A remotely located second communication

16   device 260 is illustrated in Figure 2. The communication device 260 also transmits and

17   receives radio frequency signals and the communication devices 250 and 260 may

18   communicate with each other. For example, the communication device 250 may send a

19   signal that is received by the communication device 260. In response, the communication

20   device 260 may send a signal to communication device 250. The communication device 260

21   may be a mobile (digital or cellular) telephone, a pager, or a similar portable device.

22

23   Figure 2 also illustrates various interface devices that may be used in this

24   arrangement, including the keypad 101, the camera 102, and the microphone 103. As with

25   the first exemplary embodiment, one or a plurality of the interface devices may be included in

26   the apparatus of Figure 2 at any particular time, and the interface devices may be located in

27   the proximity of a doorway, gateway, entryway, or the like. Figure 2 also illustrates the

28   speaker 170 that may also be located in the proximity of a doorway, gateway, entryway, or the

29   like. The doorbell 100 illustrated in Figure 2 may also include all the elements illustrated in

1   Figure 1 including the logic 110, the memory 120, the A/D converter 130, the D/A converter

2   140, etc.

3

4   The method of identifying a visitor using the arrangement illustrated in Figure 2 may

5   also be outlined by the flow chart illustrated in Figure 3. Returning to Figure 3, in step 310, a

6   user code from a visitor is received by the doorbell system 222. As described with respect to

7   the first exemplary embodiment, the user code may be entered using a user interface device.

8   The user code may be entered in a variety of ways, depending on the type of interface device

9   used with the apparatus. The performance of step 310 using the apparatus of the second

10   exemplary embodiment is identical to the performance of step 310 using the apparatus of the

11   first exemplary embodiment. Therefore, the description of step 310 for the first exemplary

12   embodiment is incorporated within for the second exemplary embodiment.

13

14   After the user code is received at step 310, the user code is identified at step 320. The

15   logic circuit 110 is used to identify the user code and this identification is based on the user

16   code that is entered. In identifying a visitor from the user code, the logic circuit 110 relies on

17   stored codes in the memory 120. The logic circuit 110 compares and matches entered user

18   codes with stored codes. When a user code matches a stored code, a visitor is identified. The

19   processing here may be similar to the process described with respect to the first exemplary

20   embodiment.

21

22   At step 330, the generation of a response signal follows the identification step 320.

23   Based on the recognition or identification of the user code, the doorbell system 222 generates

24   a response signal in step 330. The generation of the response signal according to the second

25   exemplary embodiment is different from the generation of a response signal as described with

26   respect to the first exemplary embodiment. While the signal may be generated from within

27   the doorbell 100 in the first exemplary embodiment, in the second exemplary embodiment the

28   signal is generated by the computer 200.

29

1   As stated, and as illustrated in Figure 2, the doorbell 100 is connected to the computer

2   200. As a result, communication is facilitated between these two devices. After step 320, i.e.,

3   after the identification of the visitor by the logic circuit, the identity of the visitor is

4   transmitted from the doorbell 100 to the computer 200. When the computer 200 is notified of

5   the identity of a visitor, the computer 200 is then able to generate a response signal indicative

6   of the visitor. The speaker 170 transmits the response signal. The response signal may also

7   be transmitted by other speakers (not shown) located throughout the residence.

8

9   As in the first exemplary embodiment, another response may be an audio response.

10 The audio responses may be stored in a computer memory 205. Because of the larger

11 memory capacity of the computer 200, more numerous and larger audio files may be stored in

12 the computer memory 205. Also, the quality of the audio responses in the computer memory

13 is better than those stored in a doorbell memory 120. As a result, stored audio responses such

14 as voice recordings are more realistic and comprehensible to a visitor. As outlined above and

15 as illustrated in Figure 5, each response is geared towards a particular identified visitor and

16 the audio responses are made audible to the home dweller through speakers (not shown)

17 placed in any preferred location at the house. The audio response may be made audible to the

18 visitor via the speaker 170.

19

20 Because of the addition of the computer 200, the functions of the doorbell system can

21 be expanded. The computer 200 can be programmed to operate and generate signals

22 according to different modes of operation. For instance, when the computer is operated in a

23 mode in which audio signals are generated in response to visitors initiating the doorbell, as

24 described above, the computer is operating in an "Audio" mode. Also, it is possible to

25 operate in a "Not At Home Audio" mode, which instructs visitors via a voice recording, that

26 home dweller is not at home. Similarly, the computer may be programmed to operate in a

27 "We Are Sleeping/ Don't Disturb Audio" mode, which instructs visitors that the occupants of

28 the house are sleeping. There may also be an "Alarm" mode, wherein the audio response may

29 be a vicious dog bark. The dog bark may vary according to the time or the number of times

30 the doorbell is activated within a particular predetermined timeframe. For instance, when the

1   doorbell is first rung, the audio response may be "Woof Woof." When it is rung a second

2   time the response may be "Rrrr Rrrrrrrr." Speakers (not shown) within the house may

3   transmit these alarm signals. Operation in this particular "Alarm" mode may provide an

4   increase in home security because of the quality of the barking sounds provided by the

5   computer 200 and also because the barking responses are not repeated within a predetermined

6   timeframe. It should be noted that although the response signals may be similar for all

7   visitors, the system still identifies the visitor by the user code. In addition to the modes

8   described, the system may include a default audio signal for unrecognized or unidentified

9   guests.

10

11   Instead of the generation of an audio response and subsequent transmission through

12   the speakers in step 330, the computer 200 may generate radio frequency signals that are

13   transmitted via the communication device 250. Here again, the computer 200 is programmed

14   to operate in a selected "Phone" mode in which radio frequency signals are generated to alert

15   the home dweller that a particular visitor is at the door. The radio frequency signals may be

16   transmitted by the communication device 250 to a remotely located communication device

17   260. The communication device 260 may be carried by the home dweller. The transmitted

18   signal may include a code that identifies the visitor to the home dweller. The communication

19   device 260 may be a mobile (digital or cellular) telephone, a pager, or a similar portable

20   device. If the communication device 250 is a modem, and the communication device 260 is a

21   mobile telephone, signals may be transmitted between the communication devices 250 and

22   260, enabling the home dweller to communicate with a visitor. Upon receiving the user code,

23   the modem dials the home dweller's mobile phone. The visitor can speak and hear the home

24   dweller through the microphone 103 and speaker 170.

25

26   It should be noted that in the second exemplary embodiment, it is possible to program

27   the computer 200 to vary response types according to user input. In response to some

28   identified visitors the computer may generate audio signals, and in response to other

29   identified guest, the computer 200 may initiate the generation of radio frequency signals. For

30   example, when a neighbor visits and enters a neighbor code, the computer 200 may generate a

1 voice-recorded response; "We are not home at the moment." However when the home

2 dweller's best friend enters her code in the doorbell system, the computer 200 may call the

3 home dweller's phone (communication device 260). The computer 200 may also provide

4 other services such as logging the identity and times of visit of each visitor that enters a code.

5 The computer 200 may also log the type of signal that was generated in response to the

6 identification of each visitor.

7

8 In an alternative method of operation of the arrangement illustrated in Figure 2, the

9 computer 200 may perform the identification step 320, instead of the logic circuit 110. After

10 a visitor enters the user code, the user code is transferred to the computer 200 as a buffer file.

11 With this information, the computer 200 may identify of the visitor at step 320. The

12 computer would therefore have a file of stored codes, and these stored codes are compared

13 with the entered user codes. When a user code matches one of the stored codes, a visitor is

14 identified. Therefore, the computer performs step 320 in a similar manner as the logic circuit

15 110. The generation of a response signal may be an audio signal or a radio frequency signal

16 and may be transmitted in a manner previously described.

17

18 What has been described and illustrated herein are preferred embodiments of the

19 invention along with some variations. The terms, descriptions and figures used herein are set

20 forth by way of illustration only and are not meant as limitations. For instance, other known

21 user interface devices may be used for the entry of guest information. Keystroke sequences

22 may be entered using a standard doorbell switch and the codes may be entered by short and/or

23 long switch depressions and/or pauses between depressions. Also with respect to the second

24 embodiment wherein the doorbell 100 is combined with the computer 200, all or some of the

25 interface devices may be connected to the doorbell 100 or the computer 200. Those skilled in

26 the art will recognize that many variations are possible within the spirit and scope of the

27 invention, which is intended to be defined by the following claims and their equivalents, in

28 which all terms are meant in their broadest reasonable sense unless otherwise indicated.

29